LIVERMORE LAB REPORT

A weekly compendium of media reports on science and technology achievements at Lawrence Livermore National Laboratory, June 23-27. Though the Laboratory reviews items for overall accuracy, the reporting organizations are responsible for the content in the links below.

Los Angeles Times

COMBATTING MICROORGANISMS

Lab scientists Nicholas Be (left) and Jonathan Allen are exploring ways the Lawrence Livermore Microbial Detection Array can help wounded combat soldiers.

New research by Lawrence Livermore scientists suggests that physicians treating future U.S. troops (and perhaps those treating some of today's wounded soldiers) may be able to take a fast and thorough census of the microorganisms living in a combat wound and tailor their treatment accordingly.

The result could mean not only speedier and more thorough healing, but fewer limbs and lives lost to postsurgical infection. For civilians suffering from traumatic injury, burns, diabetic sores and other complex wounds, the new research also may prove lifesaving.

In the study, a group of physicians, microbiologists, geneticists and technology experts describe a system, the Lawrence Livermore Microbial Detection Array (LLMDA), capable of comparing the DNA of microorganisms colonizing a wound with a vast library of stored viral, bacterial and fungal genetic sequences.

The team evaluated 124 wound samples from 44 U.S. troops wounded in Iraq and Afghanistan. Within 24 hours of a tissue sample's arrival at Lawrence Livermore, the system of microarrays was able to sort through approximately 8,100 microorganisms that had previously been genetically sequenced to find matches for microbes thriving in a wound.

To read more, go to the *Los Angeles Times*.

WALL STREET JOURNAL

HAVING A BALL

The Large Synoptic Survey Telescope is a public-private partnership on Cerro Pachon, Chile. Image Credit: Michael Mullen Design, LSST Corporation.)

Lawrence Livermore National Laboratory selected Ball Aerospace & Technologies Corp. to build the optics and support structure for the camera on the Large Synoptic Survey Telescope (LSST), which will sit atop the 8,800 ft. tall Cerro Pachon mountaintop in Chile.

Ball Aerospace teamed with Arizona Optical Systems to build the lens assembly consisting of two large refractive lenses and the precision support structure to mount the lenses. AOS will machine and polish the lenses and perform optical testing.

The LSST large aperture, wide-field optical imaging facility will explore dark matter, dark energy, the "transient" optical sky, including hazardous asteroids and astronomical events, and the formation and structure of the Milky Way. Every three nights, the LSST will take a full image of the night sky, capturing billions of objects in six colors to create a Hollywood-like motion picture of the universe. The observatory is expected to operate continuously over a 10-year period.

To read more, go to *The Wall Street Journal*.

GOING UNDERGROUND

Linc Energy has installed 44 monitoring wells at its proposed underground coal gasification test site near Wright, Wyoming to establish baseline water quality.

The United States may have as much coal as Saudi Arabia has oil, but it's not exactly easy to get to: Most of it is buried too deep for conventional mining.

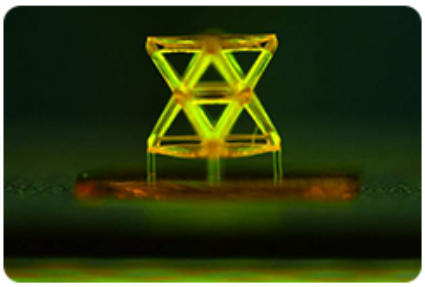
Companies are looking at underground coal gasification (UCG), in which coal is converted into synthesis gas while the coal remains deep underground. It involves drilling holes into coal seams buried as much as a mile underground, and then lighting them on fire and capturing the gases, which can be converted to fuels such as diesel. However, it's never been used commercially in the U.S.

David Camp, who directs UCG research at Lawrence Livermore, said there are upsides: miners don't have to go underground, and carbon capture is easier than with coal-fired power plants. But he says those need to be weighed against the risks. Even extremely complicated drilling technologies -- like deepwater drilling and fracking -- are easier and more cost-effective than UCG, Camp adds.

"It's fair to say I'm ambivalent about UCG," Camp said. "I really don't see where underground coal gasification, or really gasification in any kind, plays in the United States right now."

To read more, go to *National Public Radio*.

LIGHTER THAN AIR



This microscope image shows a single unit of an ultralight, ultrastiff material made from a polymer.

It seems like an oxymoron for a material to be lighter than air but stiff at the same time.

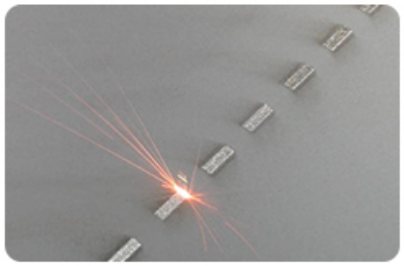
But Lawrence Livermore and Massachusetts Institute of Technology (MIT) researchers have done just that by developing a material with these properties using additive micro-manufacturing processes.

The team's development of micro-architected metamaterials -- artificial materials with properties not found in nature -- maintain a nearly constant stiffness per unit mass density, even at ultralow density. Materials with these properties could someday be used to develop parts and components for aircraft, automobiles and space vehicles.

Most lightweight cellular materials have mechanical properties that degrade substantially with reduced density because their structural elements are more likely to bend under applied load. The team's metamaterials, however, exhibit ultrastiff properties across more than three orders of magnitude in density.

To read more, go to *Science Codex*.

San Francisco Business Times HEAVY METAL



A laser fuses metal powder to form one of many successive layers that will form the final manufactured part.

Scientists at Lawrence Livermore National Laboratory developed a new and better way to "print" dense metal parts using lasers to melt and fuse metal powder.

Though commercial 3-D printers are increasingly common, this approach, called SLM or "selective laser melting," requires high-energy lasers that are fast and accurate.

Parts built using this process sometimes have to be very dense, with less than 1 percent porosity, since any spaces or voids in the metal will cause it to fail.

Computer simulations are required to figure out how the metal powder will melt and flow when hit by the laser. And if the lasers are too slow, said Chandrika Kamath, the lead author of this study, the metal will be too porous and won't work.

To read more, go to the *San Francisco Business Times*.

LIVERMORE LAB REPORT

LIVERMORE LAB REPORT TAKES A BREAK

The *Livermore Lab Report* will take a break for the week of June 30-July 4 due to the Fourth of July holiday. It will return July 11.

LLNL applies and advances science and technology to help ensure national security and global stability. Through multi-disciplinary research and development, with particular expertise in high-energy-density physics, laser science, high-performance computing and science/engineering at the nanometer/subpicosecond scale, LLNL innovations improve security, meet energy and environmental needs and strengthen U.S. economic competitiveness. The Laboratory also partners with other research institutions, universities and industry to bring the full weight of the nation's science and technology

community to bear on solving problems of national importance. To send input to the *Livermore Lab Report*, send e-mail.